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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,260	10/08/2003	David William Abraham	YOR920030013US1	5657

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EXAMINER	
MAI, ANH D	

ART UNIT	PAPER NUMBER
2814	

MAIL DATE	DELIVERY MODE
02/09/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/680,260	ABRAHAM ET AL.	
	Examiner	Art Unit	
	Anh D. Mai	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5,6,11,12,14,15,17,19-23,25 and 26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 5, 6, 11, 12, 14, 15, 17, 19-23, 25 and 26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

1. The Amendment filed October 23, 2008 has been entered. Claims 1, 5 and 20 have been amended. Claims 8, 9, 16 and 18 have been cancelled. Claims 1, 2, 5, 6, 11, 12, 14, 15, 17, 19-23, 25 and 26 are pending.

Action on merits of claims 1, 2, 5, 6, 11, 12, 14, 15, 17, 19-23, 25 and 26 follows.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 5, 6, 11, 14, 15, 17, 19, 22, 23, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata et al. (U.S. Pub. No. 2002/0142192) of record, in view of Grider et al. (US Patent No. 6,093,659).

With respect to claim 1, Kamata teaches method of patterning a magnetic thin film substantially as claimed including:

transforming a portion of the magnetic thin film (20) to be non-magnetic and electrically insulating (40) using a chemical transformation, the chemical transformation comprises using a reactive plasma comprising halogen-containing gas,

wherein the portion of the magnetic thin film (20) comprises NiFe and the transforming comprises transforming the NiFe to a fluorine-containing film (40), and

wherein the fluorine-containing film (40) is electrically insulating. (See Figs. 3A-B, 13A-B).

Thus Kamata is shown to teach all the features of the claim with the exception of explicitly disclosing the halogen-containing gas comprising a combination of fluorine-based gas and *a bromide-containing gas.*

However, Grider teaches halogen species including fluorine-containing gas and bromide-containing gas are routinely usable together in a same chemical reaction. (See claim 17).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to transform the portion of the magnetic thin film of Kamata to be non-magnetic and electrically insulating film utilizing halogen-containing gas comprising fluorine-based film and a bromide-containing gas as taught by Grider since the species of halogen-containing gas are well known in the art to be utilized together for the same intended purpose.

With respect to claim 2, the method of Kamata further includes: providing a mask (30) over the portion of the magnetic thin film (20) to be preserved using photolithography.

With respect to claim 5, the fluorine-based reactive plasma of Kamata CF_4, SF_6, CHF_3.

With respect to claim 6, the pressure used in the converting of Kamata is within a range of about 10 mT to about 30 mT.

With respect to claim 11, the mask (30) of Kamata comprises a photoresist.

With respect to claim 14, the chemical transformation of Kamata can be performed at room temperature.

With respect to claim 15, the reactive plasma of Kamata includes a fluorocarbon.

With respect to claim 17, the reactive plasma of Kamata includes sulfur hexafluoride.

With respect to claim 19, the pressure of Kamata is selectively employed for the plasma sputtering such that the magnetic thin film material (20) is substantially free of erosion.

With respect to claim 22, the mask of Kamata comprises an insulating hard mask (30, 360), the method of Kamata further includes: after the converting, selectively etching the insulating hard mask (30, 360) to remove the insulating hard mask.

With respect to claim 23, the method of Kamata further includes: forming a conductive material (380) over the area where the insulating hard mask (360) was etched. (See Fig. 13C).

With respect to claim 25, the magnetic thin film (20) of Kamata includes a magnetic tunnel junction (MTJ), and wherein after the converting portion, the edges of the magnetic tunnel junction have no exposure to oxygen. (See Figs 3C, 13B).

With respect to claim 26, the edge smoothness of the MTJ of Kamata is inherently determined by a line edge roughness of the mask (30, 360).

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata '192 and Grider '659 as applied to claim 2 above, and further in view of Ning et al. (U.S. Pub. No. 2002/0098676) of record.

Kamata and Grider teach the method as described in claim 2 above including providing the mask (30) over the portion of the magnetic thin film (20) using photolithography.

Thus, Kamata and Grider are shown to teach all the features of the claim with the exception of utilizing a metal hard mask.

However, Ning teaches utilizing photolithography to provide a mask including TaN, TiN (244) for patterning.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to provide a hard mask of Kamata including a TiN and TaN as taught by Ning for patterning over the portion of the magnetic thin film.

4. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamata and Grider as applied to claim 2 above, and further in view of Chen et al. (U.S. Patent No. 6,165,803) of record.

With respect to claim 20, Kamata teaches providing the mask (30) over the portion of the magnetic thin film (20) to be preserved using photolithography.

Thus, Kamata and Grider are shown to teach all the features of the claim with the exception of including further process steps.

However, Chen teaches a method of patterning a magnetic thin film including: transforming a portion of the magnetic thin film (42) to be non-magnetic and electrically insulating (42b) using a chemical transformation, the process further comprises:

forming an insulating layer (72) over the converted portion (42b) of the magnetic thin film (42) and the mask (52); and

etching the insulating layer (72) and the mask (52) to planarize the upper level of the mask (52) and the insulating layer (72). (See Fig. 12).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention was made to further process the transformed thin film of Kamata after the transformation as taught by Chen to form the MTJ device.

With respect to claim 21, the method of Chen, further includes:

selectively etching the mask (52); and forming a conductive material (70) over the insulating layer (72) and the area where the mask (52) was selectively etched. (See Fig. 13).

Response to Arguments

5. Applicant's arguments with respect to amended claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Anh D. Mai/
Primary Examiner, Art Unit 2814